



BBGrid – Technical Session

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Agenda

- **Globus Basics**
- PCG experience
- Next steps in BBGrid
- Technical details for Globus installation

Grid Infrastructures

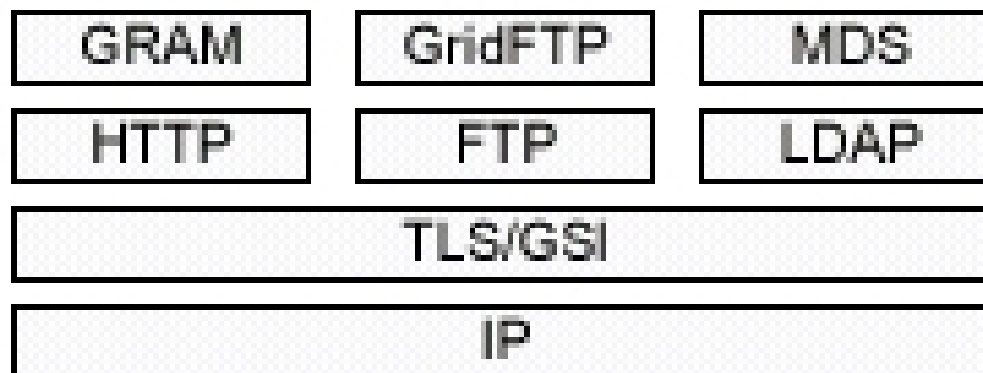
- Authentication
 - Data access and movement
 - Resource monitoring
 - Resource usage
 - Scheduling
 - Intra-/Inter-Node communication
- simplifies development of distributed applications for **existing** heterogeneous execution environments

The Globus Toolkit

- Globus Project (Argonne National Laboratory)
- Open source, integrates several third-party projects (OpenSSL, RSA, Axis, OpenLDAP, wuFTP)
- de-facto standard for grid infrastructures, reference implementation for GGF standards
- offers building blocks and tools for developers and integrators
- All major Unix platforms, Windows as client
- C, Perl, Java, Python API's
- Version 2 (1997) : proprietary grid architecture
- Version 3 (2003) : OGSI-based architecture
- Version 4 (fall 2004) : WSRF-based architecture

Globus Toolkit Version 2 (GT2)

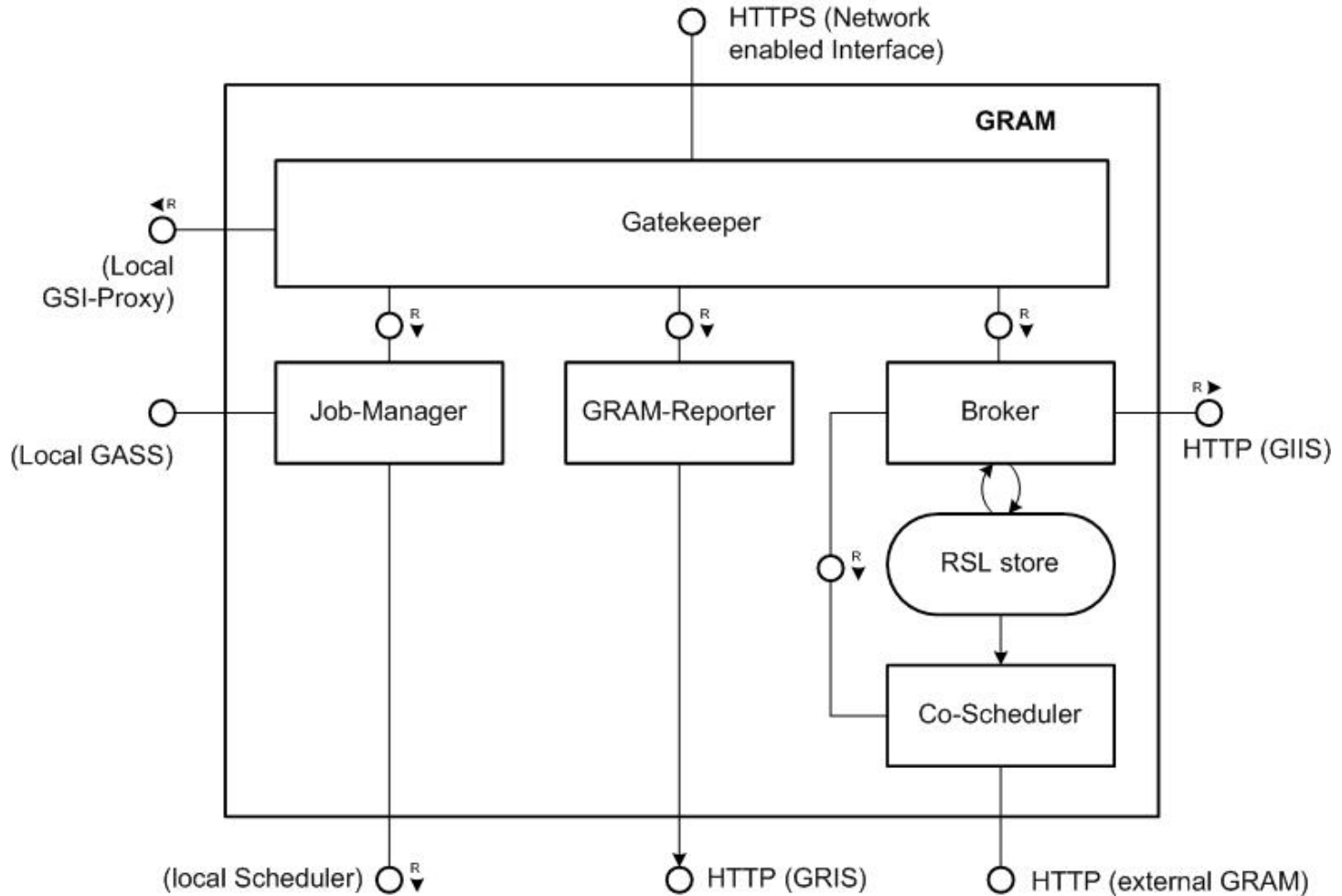
- Globus Resource Allocation Management (GRAM, RSL)
- Metacomputing Directory Service (MDS)
- Globus Security Infrastructure (GSI)
- Heartbeat Monitor (HBM)
- Globus Access to Secondary Storage (GASS, GridFTP)
- Communication (Nexus, MPICH-G2)



GRAM

- Translates generic resource request (RSL) into explicit commands for a set of resources (cluster, single machine)
- Gatekeeper:
 - Frontend for all GT2 machines
 - Security check, proxy validation
- Job Manager:
 - Monitors and controls jobs on the resource (single machine, cluster)
 - Interacts with multiple local schedulers (Condor, LSF)
- GRAM reporter:
 - Collects and manages system-specific resource information
 - Forwards information to other nodes (GIS)

GRAM



MDS

- Hierarchical directory information tree
- Globus Resource Information Service (GRIS)
 - Installed on a grid node
 - Supplies information about a specific resource
 - Local information providers
- Globus Institution Indexing Server (GIIS)
 - Collects information from GRIS instances
 - Allows information queries with RSL over HTTP
- Globus Resource Information Protocol (GRIP), based on LDAP

GridFTP

- Based on standard FTP protocol (RFC 2228)
- Striped, partial and parallel file transfer
- Restartable file transfer
- Security protocols on connectivity layer (GSI)
- Backend's for heterogeneous file systems
- Replica management extension
 - Selection
 - Location
 - Mirroring
- GGF Working Group

Globus Security Infrastructure (GSI)

- Secure communication

- Authenticated
- Perhaps confidential

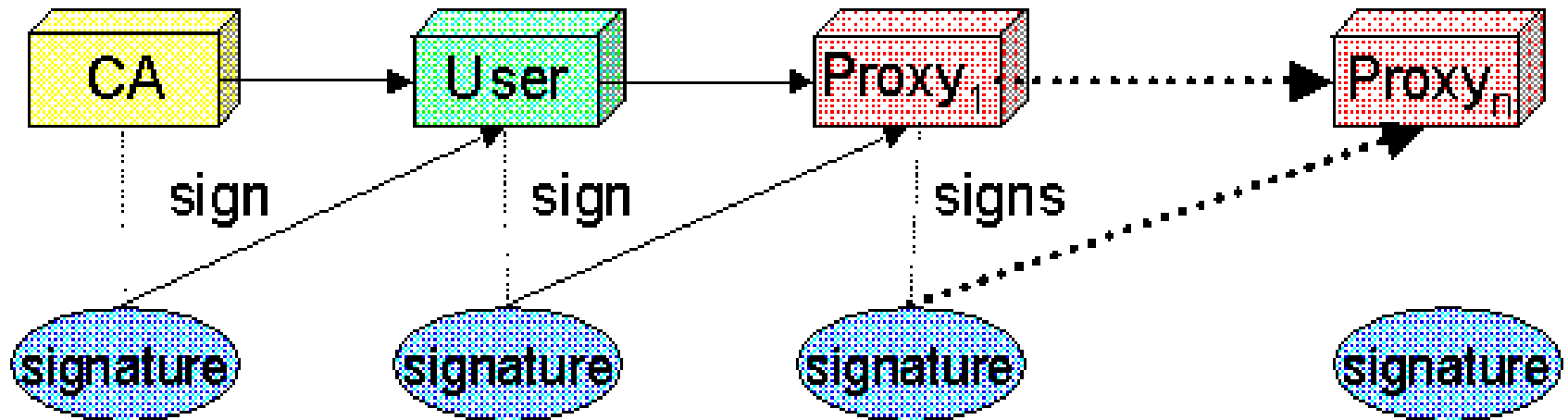
- Security across organizational boundaries

- Prohibition of central management

- Single sign-on

- Credential delegation

Delegation and Single Sign-On

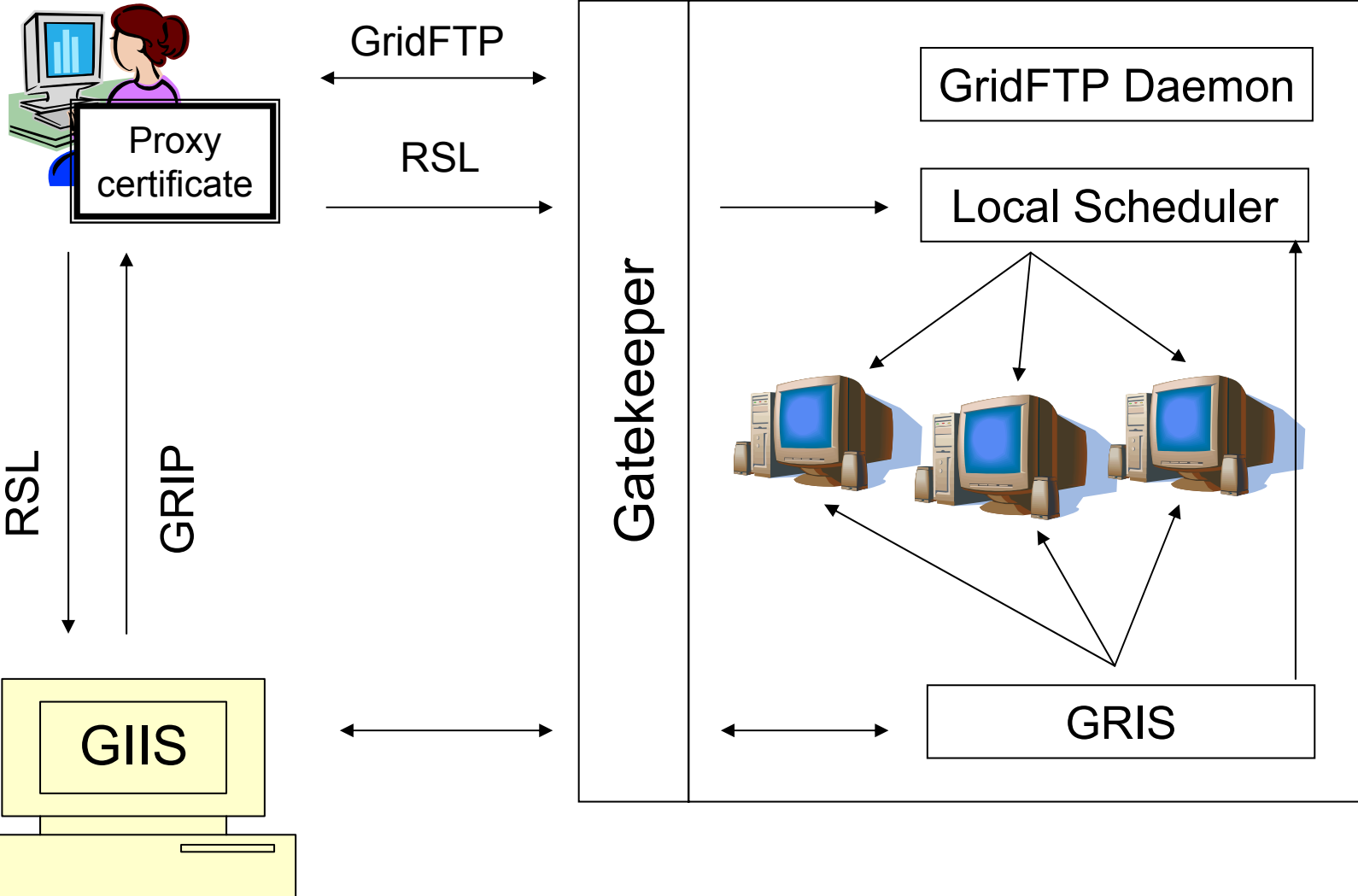


- SSL Extension
- Proxies have limited lifetime
- Mutual authentication considers whole *chain of trust*

Communication with Nexus

- Nexus library for abstraction from underlying transport protocol
- Pluggable backend's
- Implementation for TCP/IP

GT2 usage scenario

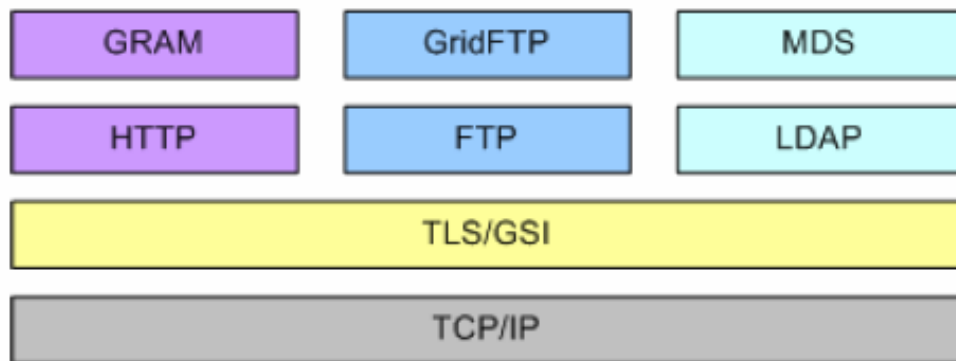


Why GT3 ?

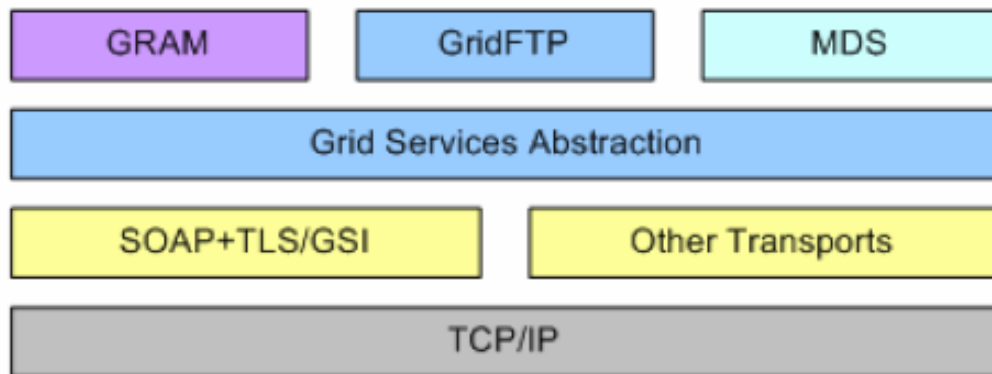
- Core protocols (GRAM, LDAP, GridFTP) with overlapping but different functionality
- Service orientation
 - Decouple service from concrete resource (not relevant for the client)
 - Late binding and transport protocol independence
- Web service as foundation for heterogeneous environments, WSDL as IDL
- Service = abstract interface + semantics
- Web Services:
discovery & invocation of persistent services
- Grid Services:
additional need for stateful service instances
 - Definition of interfaces
 - Management of service instances (lifetime management)

GT2 → GT3 transition

Globus 2.4



OGSA based Globus



GT3 Architecture

■ OGSI interfaces implementation

- Service data discovery
- Factory services
- Handle resolving
→ Reference implementation

■ Security infrastructure

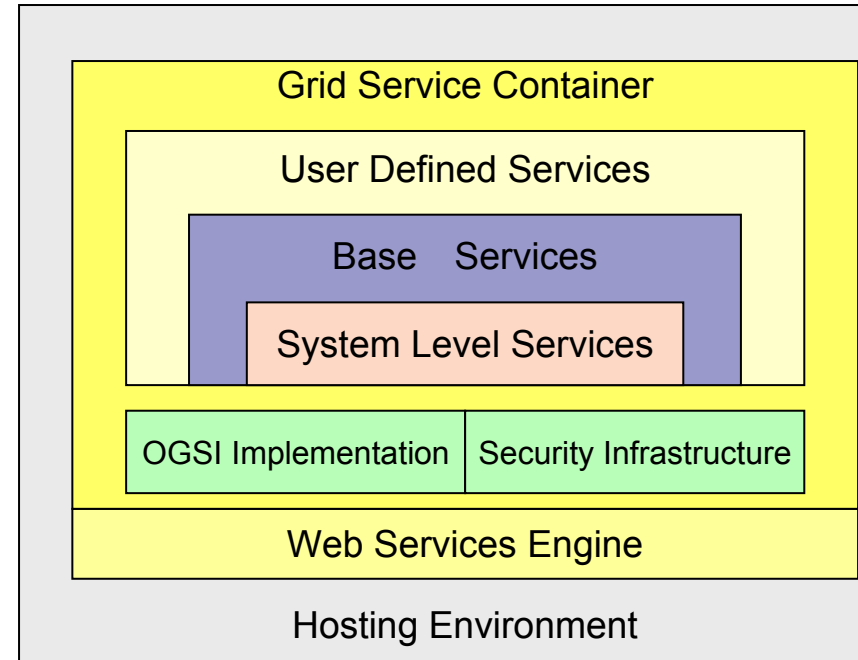
- GT2 GSI and PKI
- Message level security for SOAP (WS-Security, XML Signature)
- Transport level security (TSL/SSL)

■ System Level Services

- Hosting environment ping service
- Logging management service
- Container management service

■ Base Services as inherited GT2 functionality

- Resource Management (GRAM → MMJFS / MJS)
- Information Services (GRIS → OGSI FindServiceData interface / Index service)
- File Transfer (GridFTP → RFT service)



GT3 Client Interfaces

■ Core libraries

- Java & C stubs
- PyGlobus

■ High-level abstraction

- GridLab project (GAT, Cactus)
- Condor-G
- Web portals
- Maybe Grid-Occam ?!?

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Next Steps for BB-Grid

■ Today

- Identification of GIS machine
 - tb1.asg-platform.org
- Clarification of CA procedures
 - each site maintains own CA
 - new entries for the grid-mapfile exchanged per e-mail
- Do we want a web-based portal ? Who runs it (web server, myProxy installation) ?
- BBGrid Wiki
 - set up by BTU

Your next steps (suggestion)

- CA installation, distribution of CA certificate
- Firewall configuration, pair-wise creation of SSH accounts; connectivity tests
- Start Globus installation, ensure an externally resolvable DNS entry; base dir: /usr/local/globus; Version 3.2.1
- Create certificate requests for your Globus machine and the first users, sign them with you CA
- Install signed certificates
- Test locally
- Pair wise job submission

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Mandatory Ports in Globus

- Client (>1024) → Globus machine
 - 22 / tcp (SSH, GSI SSH)
 - 2119 / tcp (Gatekeeper)
 - 2135 / tcp, 2135 / udp (MDS GIS)
 - 2811 / tcp (GridFTP)
 - 40000 / tcp – 40010 / tcp (GridFTP, job management)
- Globus machine (>1024) → BB-Grid GIIS machine
 - 2135 / tcp, 2135 / udp
- No NAT (client compares the reverse lookup of the server IP with the certificate machine name)

Optional Globus Ports

- BB-Grid Portal machine (>1024) → BB-Grid MyProxy machine
 - 7512 / tcp
- Globus machine (>1024) → BB-Grid RLS server
 - 39281 / tcp
- Open port range on client side
 - Needed for
 - Optional Job output redirection to client
 - Optional File staging with globusrun
 - Needs open port range for incoming connections on the client side
 - GLOBUS_TCP_PORT_RANGE environment variable on client and server

Globus Installation

- More details here:

<http://www.dcl.hpi.uni-potsdam.de/research/grid/testbed/>

- Download for Globus pre-WS package:

<http://www-unix.globus.org/ftppub/gt3/3.2/3.2.1/installers/src/gt3.2.1-preogsi-source-installer.tar.gz>

- Preparation

- Create */usr/local/globus* and change owner to *globus.globus*
- Create */etc/grid-security*
- *su – globus*

Globus Installation

■ Source installation:

http://www-unix.globus.org/toolkit/docs/3.2/installation/install_installing.html

- Ignore MMJFS installation
- Don't ignore compiler error messages

■ Security setup:

http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_req.html

- Don't forget to run `$GLOBUS_LOCATION/bin/setperms.sh` as root
- Prof. Schnor's group recommends *TinyCA* for CA management

Globus Installation

■ Request and install certificates:

- *grid-cert-request -host FQDN* for the machine job manager
- *grid-cert-request -service ldap -host FQDN* for the machine GIS
- *grid-cert-request* for users
- Sign with your CA
- Copy signed host certificate to */etc/grid-security/hostcert.pem*
- Copy signed LDAP certificate to */etc/grid-security/ldap/ldapcert.pem*
- Copy signed user certificate(s) to *~/.globus/usercert.pem*
- Create */etc/grid-security/grid-mapfile* as user root
(*grid-cert-info -subject* is your friend)
- Try *grid-proxy-init* for a given user

Globus Installation

■ MDS / GRAM installation:

http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_prews.html

- Look in the Globus *sbin* directory for prepared startup scripts (*/etc/init.d*)
- *grid-proxy-init* and *globus-job-run localhost /bin/date* should work now
- Try also *grid-info-search*

■ GridFTP installation:

http://www-unix.globus.org/toolkit/docs/3.2/installation/install_config_gridftp.html

- Remove */etc/grid-security/gsi-authz.conf* and */etc/grid-security/gsi-gaa.conf*
- Try *globus-url-copy gsiftp://[FQDN]/tmp/foo file:///tmp/bar*